



User Manual

Audio Frequency System Locator-Set
TG 20/50, TG 600
UL 30



Guide to this Operating Instruction



For fast finding of important information the corresponding text passages are marked with symbols (symbols not stated here are self-explanatory).



More and special information concerning the respective subject are available from BAUR.



Important information about the instrument!

In any case, read carefully!



Important information text.



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In the interest of our customers we reserve the right for modifications due to technical progress. Illustrations, descriptions and delivery content are therefore not binding.

Preface

This manual contains all information necessary for the correct handling and operation of the described system. Before using the system please read carefully these Operating Instructions. If you have any questions please contact directly:
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or refer to your nearest BAUR representative.

Safety precautions



The Audio Frequency System is built in accordance with today's state of engineering and is safe to operate. Individual components and the finished unit are inspected continually by our qualified staff within the framework of our Quality Assurance Provisions. Each unit is subjected to thorough testing prior to shipment. It is imperative to every person who is involved with the installation, start-up, operation and maintenance to have read and understood the complete Operating Instruction. It is the responsibility of the customer to ensure that only authorized persons may be allowed to use the unit. Operators must notify immediately any changes to the unit that detract from its safety.

The Audio Frequency System Locator Set is intended to be used exclusively for route tracing and fault location of electrical cables and metallic gas and water pipes.

Any other or additional use is deemed to be in contravention of the intended use. The manufacturer shall not be liable for damage resulting from any such use. In such a case the risk shall be borne solely by the user.

The local safety and accident prevention regulations are always applicable to the operation of the unit.

Warranty



At the customer's written request we undertake to repair or replace at our discretion and as quickly as possible all parts that become faulty as the demonstrable result of poor material, faulty design or defective workmanship. We shall bear the costs of any faulty parts requiring replacement, but not the costs of transport to us and back to the customer, nor the costs of packing and insurance! The **12 month warranty** time starts from delivery. We shall not be liable for any damage resulting from normal wear and tear, improper handling, non-observance of Operating Instructions and safety regulations. We shall also refuse to accept any liability if the customer carries out repairs or changes to the unit themselves or has others carry them out! The warranty does not cover damage in transit, batteries, fuses and any readjustments in accordance with the Operating Instructions!

We draw attention in addition to the '**General Sales and Business Conditions**' of:

BAUR Prüf- und Messtechnik GmbH
Raiffeisenstrasse 8
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1 Product information

In combination with Surge Voltage Generators (SSG / STG) or Audio Frequency Generators (TG20/50 and TG600) and accessories like BM 30, earth sticks, the Universallocator UL 30 is used for:

- pin-pointing of cable faults
- route tracing of buried cables or metallic pipes
- propagation time measurement
- Cable sheath fault location
- Combined tracing and pin pointing

With the help of an audio frequency transmitter (TG20/50 or TG600) an electromagnetic field in the cable is generated.

Depending on selected tracing and measuring methods, the detection is done by an electromagnetic sensor

The received electromagnetic and acoustic signals are amplified and indicated by the Audio Frequency Receiver UL 30:

- acoustically via the integrated loudspeaker or a headphone (to be connected)
- optically on the integrated LCD display.

In connection with a Surge Voltage Generator SSG the surge voltage impulse (magnetic field) is indicated on the pointer UL 30 when performing a coincidence measurement. The impact noise is heard via headphone of the loudspeaker.

With the propagation time measurement the time difference between magnetic and acoustic impulse is evaluated. The minimum of the time difference indicates the cable fault position.

Special advantages:

- at cable faults which acoustically are very difficult to locate, the coincidence measuring method gives additional help to verify the faulty point.
- with cables in pipes the fault position can be located accurately above the cable route.

2 Description of Locator-Set

The Audio Frequency System Locator-Set is used for route tracing and fault location of:

- electrical cables
- metallic gas and water pipes.

Functions and procedures

With the help of an audio frequency transmitter (TG20/50 or TG600) an electromagnetic field in the cable is generated. The field is detected by sensors (e.g., detecting rod SP 30,).

The signal is amplified by the audio frequency receiver UL 30 and indicated acoustically via a headphone or a loudspeaker or optically on the display.

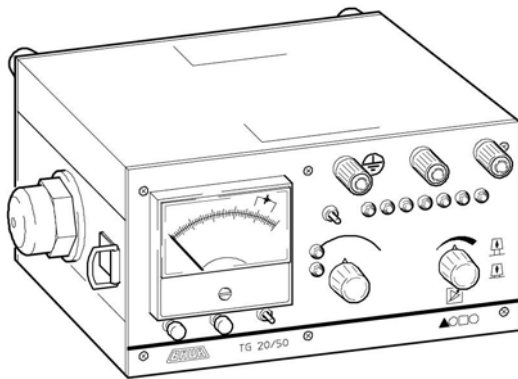
Fields of application

With its various sensors and by selecting specific tracing and measuring methods a wide range of applications is possible:

- Routing of cables and metallic pipes
- Depth determination of cables and metallic pipes
- Cable selection
- Cable detection even on live cables and lines
- Location of cable joints and branches
- Accurate pin-point fault location according to the BAUR twist method in conjunction with the powerful Audio Frequency Transmitter TG20/50 or TG600.
- Accurate pin-point fault location in conjunction with the Surge Voltage Generator SSG.
- Accurate pin-point fault location in piped cables by application of the acoustic propagation time measurement.

2.1 Audio Frequency Generator TG 20/50 and TG 600

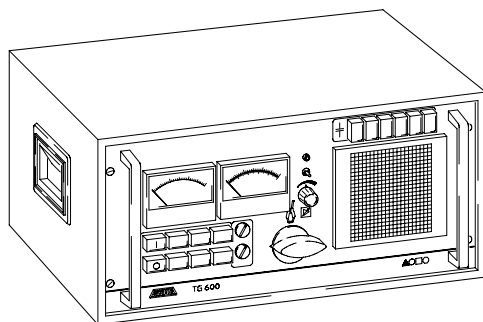
Audio Frequency Generator TG 20/50



Description TG 20/50

The Audio Frequency Transmitter Locator TG 20/50 is a powerful, battery operated instrument with an integrated power supply unit. An output of 50 VA is available during mains operation and therefore application for accurate pin-point fault location on twisted multi-core cables is possible. As well, cable tracing can be done.

Audio Frequency Generator TG 600



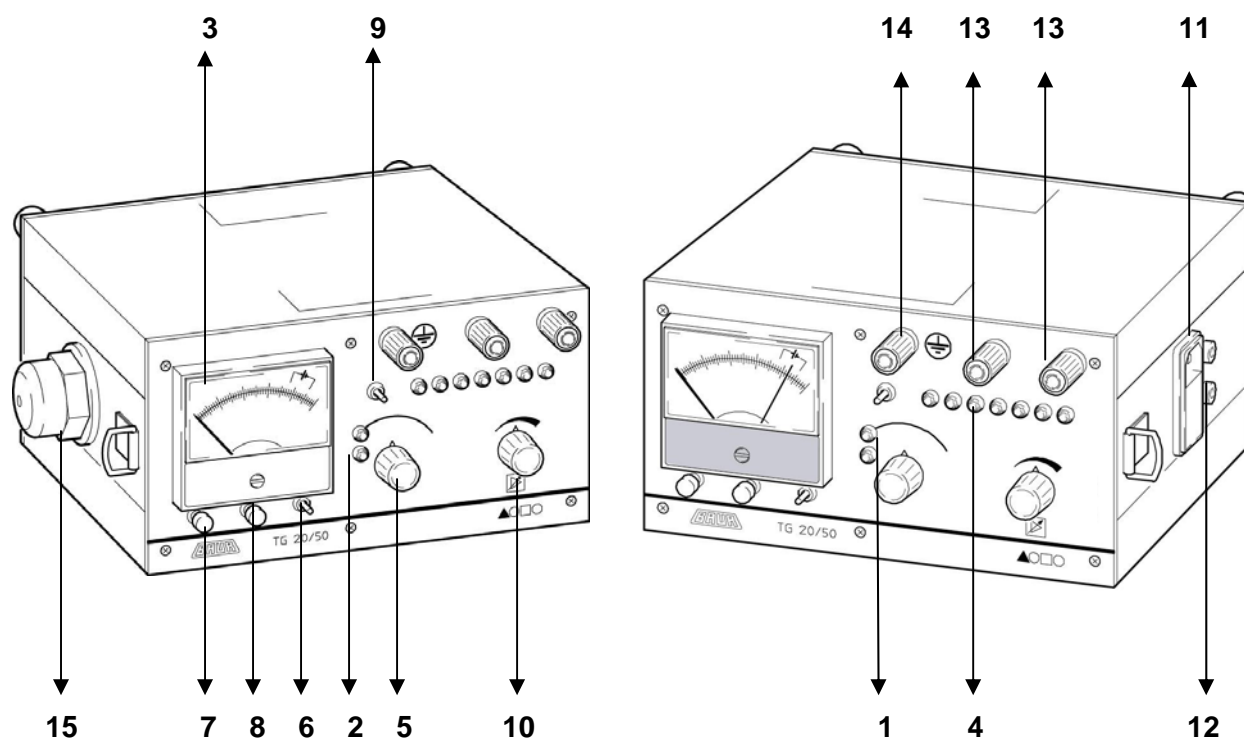
Description TG 600

The Audio Frequency Transmitter Locator TG 600 has been special designed for the pin-pointing location of cable faults and joints.

Due to indication of input and output current, selection of the correct adjustment is facilitated.

Beside the use for cable fault location, also high frequency burn down processes can be carried out, particularly on signal or telecommunication cables. The maximum output current can be switched between 60VA and 600VA.

2.1.1 TG 20/50



Display elements:

- 1 Power control
- 2 Charge control
- 3 Pointer instrument for I_{out} and I_{in} and battery control
- 4 Indication of impedance level

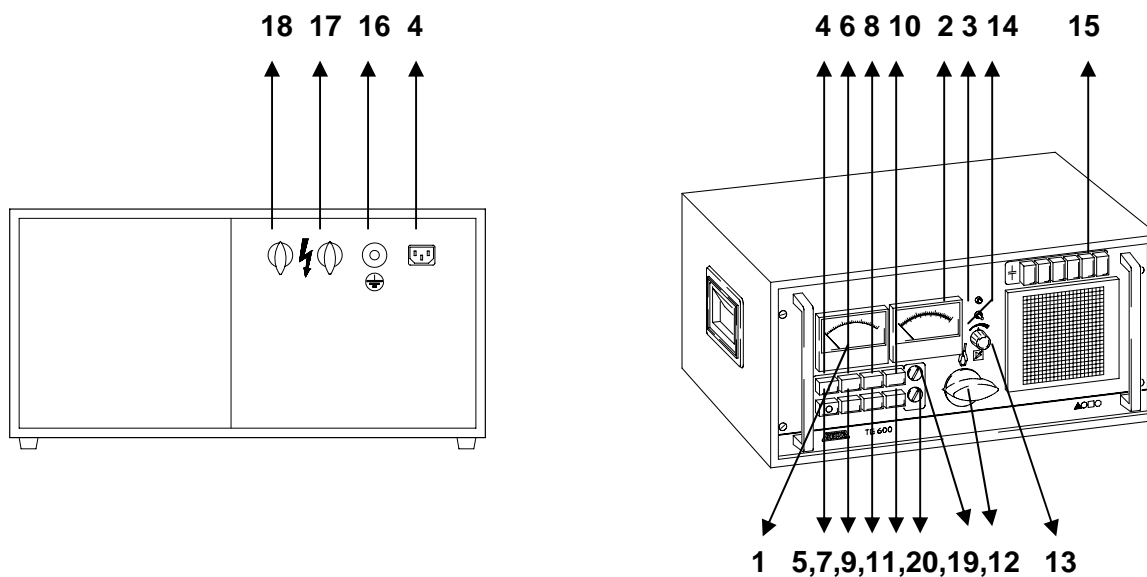
Operating elements:

- 5 ON switch and mode selector
- 6 Button for battery control and instrument illumination
- 7 Button for indication of I_{in}
- 8 Button for switching measuring range $\times 0.1$ for I_{out}
- 9 Button for automatic or manual impedance adjustment
- 10 Regulating switch for output current

Interfaces:

- 11 Mains connection
- 12 Connection for external battery
- 13 Output socket
- 14 Protective earth terminal
- 15 Connection for loop antenna

2.1.2 TG 600



Display elements:

- 1 Input current of adjusting transformer
- 2 Output current of adjusting transformer
- 3 Overtemperature indication

Operating elements:

- 4 Mains ON
- 5 Mains OFF
- 6 Frequency selection 2 kHz
- 7 Frequency selection 10 kHz
- 8 Continuous operation
- 9 Impulse operation
- 10 Output power 60 VA
- 11 Output power 600 VA
- 12 Impedance selector switch Zi
- 13 Power control
- 14 Measuring range selector for output current
- 15 Push-buttons for compensation capacitors

Interfaces:

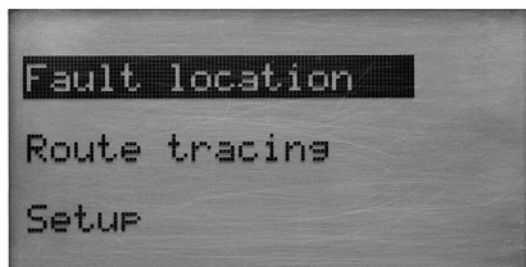
- 16 Mains connection
- 17 Protective earth terminal
- 18 Output sockets
- 19 Fuse F1
- 20 Fuse F2

2.2 Universal Locator UL 30

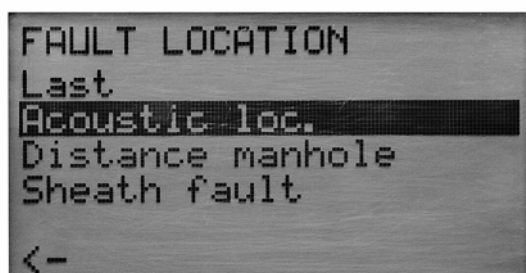


2.2.1 Menu

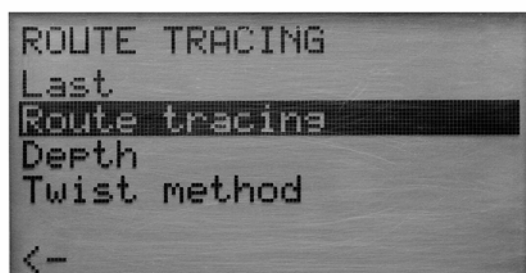
A application-oriented menu structure allows fast and easy operation of the UL 30. At main menu the application could be selected. The following submenus contain the special fault location- respectively tracing methods.



Fault location:



Route tracing:



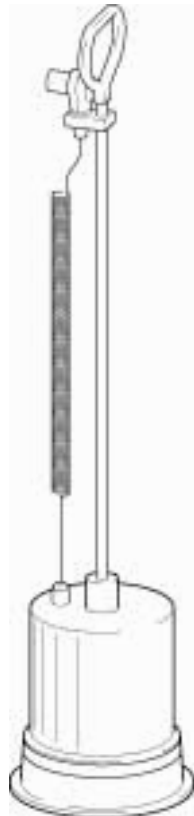
Setup:



2.3 Magnetic and acoustic sensors

Several sensors are available for reception of magnetic and acoustic signals which are used depending on selected tracing and measuring method.

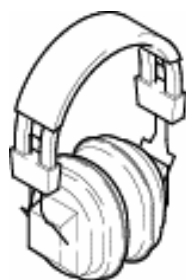
BM 30



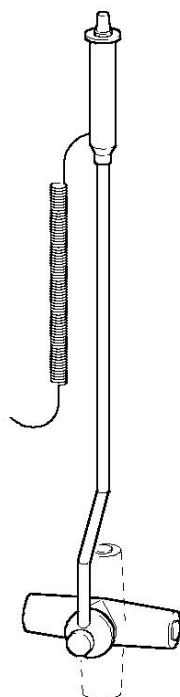
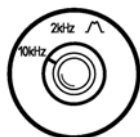
The highest sensitivity of the ground microphone is at the range of 200Hz. Therefore, it is most suitable for pin-pointing of flashover faults according to the Surge Voltage method. Its special decoupled housing suppresses possible ambient noises.

Included into the BM 30 is a magnetic sensor to enable the propagation time measurement and a tracing of cable line while pin pointing.

KH 30



The headphone KH 30 is connected to the Audio Frequency Receiver via a 3-pin jack plug (6.3mm). For suppressing ambient noises the type KH20/S headphone is used.

SP 30


The detecting rod consists of a searching coil adjusted to an oscillating circuit by condensers. Using the switch on the handle of the detecting rod the frequency can be adapted to the signal frequency of the Audio Frequency Generator. The hinged searching coil can be turned by 45° or 90°. The 45° position is used for determination of the depth of buried cables.

2.4 Technical data

Audio Frequency Generator TG20/50

Output power	0 - 50VA in mains operation 0- 20VA in battery operation
Output current	max. 8 A
Output impedance	in 7 steps 1 / 3 / 10 / 30 / 100 / 300 / 1000 W with automatic adaptation
Frequencies	2 frequencies, switchable standard: 2kHz and 10kHz other frequencies optionally
480 Hz 800 Hz 1030 Hz 1090 Hz 1350 Hz 1450 Hz 2000 Hz	→ Df - $\pm 0.1 \%$ k-faktor k - 1,5 % at 4 VA
9820 Hz 10000 Hz 12000 Hz	→ Df - $\pm 0.1 \%$ k-faktor k - 3 % at 4 VA
Operating modes	Continuous operation and impulse operation
Display	Illuminated instrument with indication of I_{out} (in A); switchable via button I_{in} (in A); Battery test Indication of impedance levels with LED
Output	Non-contacting pole terminals (safe from contact) and socket for loop antenna on side cover
Power supply	Mains connection 110/120, 220/230, 240 V, 50-60Hz
Power consumption	150VA at 50VA output power Internal lead acid battery 12V / 9.5Ah External battery 12V - 24V (reverse battery protection)
Charging unit	Overcharge protection 80% of battery capacity is reached within 14 hours; when in mains supply, charging is made in all operating modes
Low level discharge protection	Unit is switched off before battery is completely discharged
Operating time battery	at 20VA approx. 2.5 hours
Operating temperature	-20°C to +50°C
Dimensions	290 x 130 x 250 mm
Weight	approx. 9.5 kg

Audio Frequency Generator TG 600

Output power	at 2 kHz in 2 steps 600VA / 60VA at 10kHz in 2 steps 450VA / 45VA
Output current	max. 30 A
Output impedance	in 8 steps 0.3 / 0.8 / 1.8 / 4 / 10 / 30 / 100 / 300 W
Frequencies	Quarz-stabilized: 2kHz and 10kHz; other frequencies on request
Operating modes	Continuous operation and impulse operation
Display	2 instruments for indication of I_{in} and I_{out}
Reactive power compensation	adjustable in 63 steps
Power supply	110/120, 220/230 V, 50-60Hz
Power consumption	1800VA at 600VA output power
Overload protection	Overtemperature switch-off and indication
Operating temperature	-20°C to +40°C
Dimensions	505 x 255 x 330 mm
Weight	approx. 38 kg

Universal Locator UL 30

Receiving frequency	50Hz – 10kHz, 815Hz, 2kHz, 10kHz + 2 additional frequencies on request
Filter	digital
Passive reception	50/60Hz mains signal
amplification	0-38 dB
propagation velocity range	0-96ms
operating temperature	-20°C...+55°C
protection	water- and dust protected
power supply	4x1.5V cells (IEC LR 6)
battery life (normal operation)	approx. 50h
weight	550g

3 Put TG 20/50 into operation

Operating the Audio Frequency Transmitter TG20/50 either

- with mains supply (110/120V, 220/230V or 240V / 50Hz or 60Hz), output power of 50VA
- via an internal battery (for mobile use), output power approx. 20VA
- via external battery (12V to max. 24VDC)

Remark: Pay attention to correct polarity (+ red, -black)!

Designed for continuous operation

In all operating modes the unit is designed for continuous operation. The output power of 50VA is only reached with:

- mains operation or external battery operation (with 24VDC)
- optimum adjustment.

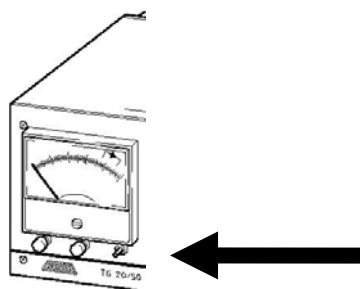


During mains and battery charging operation, please observe that:
The voltage setting of the mains voltage socket must correspond to the local mains voltage!

Carry out battery test

The integrated battery (=lead-acid battery) is protected by a low discharge protection circuit causing the TG20/50 unit to be switched off at a discharge voltage of 10.5V.
Before each mobile use and battery operation, please check the battery state of charge.

Check state of charge using control button



Charge battery

If pointer of instrument is below the marked range:

- Connect TG20/50 to mains the charging control lamp „charge“ lights up. The battery is charged by the built in charger (with an overload protection).
- General **battery charging time** should be at least **12 to 14 hours!**

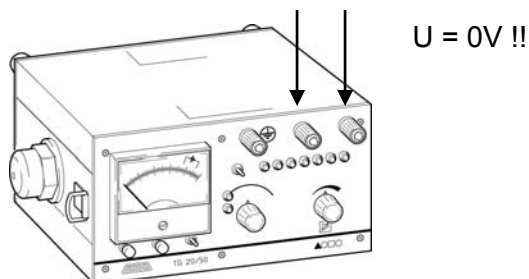
The TG20/50 unit can also be used during the battery charging process. That means, the integrated battery is also charged during each mains operation.



Do not store lead acid battery in a discharged state. Charge the battery all 14 days during the night!

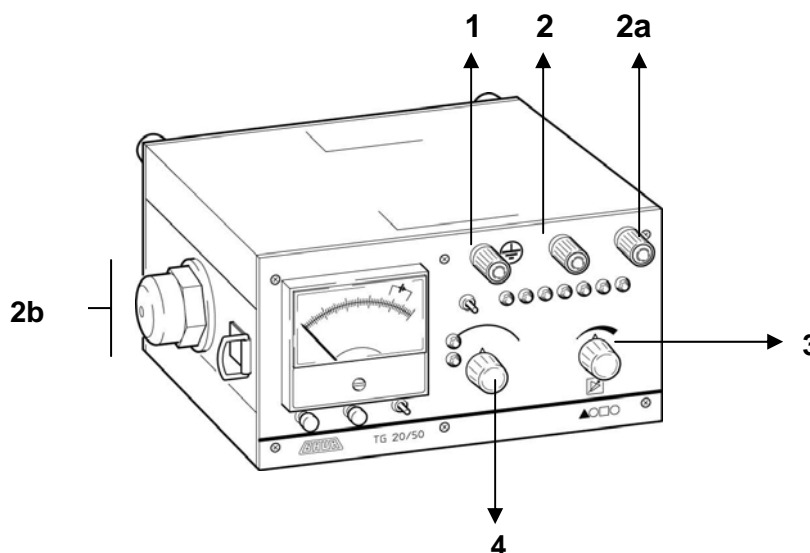
Connection of Audio Frequency Generator

Connecting the TG20/50 unit is made either via the output sockets "output" (galvanic con.), the clip on device AZ 10 or the loop antenna RA 10



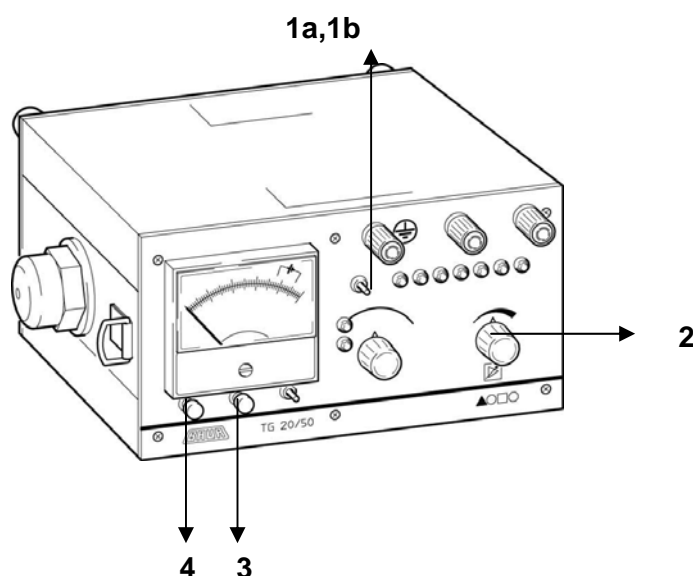
Do not connect live cables and lines (e.g. interference noises, mains pick-ups) to the sockets 'output'! Danger of unit destruction!
Before connection, always check if line is zero potential!

Carry out galvanic or inductive connection



	Step	Procedure
Carry out either step 2a or 2b	1	Connect earth lead.
	2a	Make galvanic connection: Connect a dead cable/line to the two black sockets 'output'.
	2b	Make inductive connection: Remove side cover and connect loop antenna.
Switch on Audio Frequency Generator	3	Turn output regulator completely to the right stop. Observe max. permissible voltage of connected line.
	4	Set mode selector to the desired operating frequency. Power Control lamp lights up.

Carry out automatic or manual load adaption



Condition for automatic load adaption:

- output current $I_{out} > 10\text{mA}$!

Make a manual load adjustment at:

- high impedance load

Carry out automatic (1a) or manual (1b) load adjustment

Step	Procedure
1a	Press button to pos. „auto“. If an LED of the impedance adjusting level lights up: <ul style="list-style-type: none"> - the output impedance is adjusted - a voltage is on the „output“ sockets
1b	Press button to pos. „man“ as long as the desired adjusting level is reached.
2	Adjust desired output current using the output regulator.
3	Press button I_{out} = instrument range is switched to 1A.
4	Press button I_{in} . The current consumption of the amplifier is indicated. With battery operation: $I_{in}=3\text{A}$ -battery 9Ah=approx. 3 hours of operating time

Audio Frequency Generator TG20/50 is ready for operation.

Overload protection

The power output stage of the TG20/50 unit is protected by a terminal circuit breaker.
After a switch off:

- using the mode selector - switch on again after a certain cooling period

4 Put TG 600 into operation

The TG600 unit a power generator

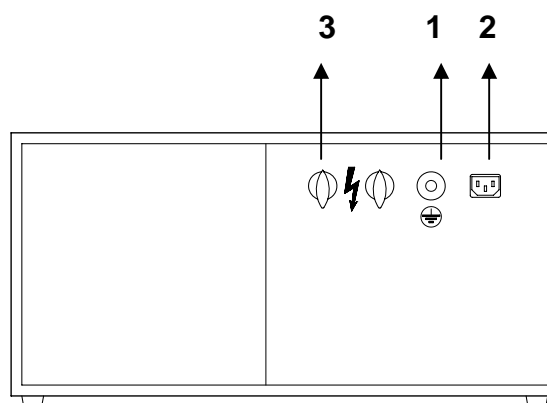
The TG600 unit is designed for cable fault location according to the twist method. At a output frequency of 2 kHz, the power is 600VA at 10kHz 450 VA.
The operation can only be done on mains (220/ 230 V; 50/ 60Hz or 110/ 120 V).

Only for mains operation

The Audio Frequency Transmitter TG600 is only operating:

- with mains supply 220/230V ; 50Hz (110/120V ; 60Hz)

Connection of TG600

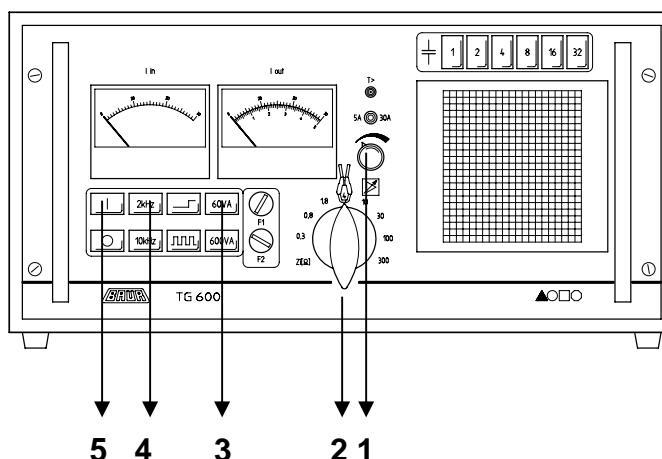


- Do not connect live cables and lines (e.g. interference noises, mains pick-ups) to the sockets 'output'! Danger of unit destruction!
- Before connection, always check if line is clear of voltage!

Connection

Step	Procedure
1	Connect earth lead.
2	Connect mains cable.
3	Connect output lines.

Set Audio Frequency Generator



Proceedings

Step Procedure

- 1 Turn power control to „0“ (0 left limit stop).
- 2 Set impedance selector switch to $Z_i = 0.3 \text{ W}$.
- 3 Select max. output power with button „60VA“ or „600VA“.
- 4 Select output frequency with button „2kHz“ or „10kHz“.
- 5 Switch on unit by pressing button „ON“. TG600 is ready for operation.

Impulse operation

By switching, the TG600 unit can be operated at 2kHz and at 10kHz. As a result, the detecting signal can be distinguished from the interfering signal easier. Do not apply with twist method.

Operation with reduced power

For most fault location methods (e.g. twist method) a highest possible current in the cable is advantageous. When tracing cables (route determination) and especially for cable selection, current induction from adjacent lines must be avoided. In such cases, an output power of approx. 1VA to max. 100VA is sufficient.

Max. output voltages

Impedance level Z_i	0,3	1	3	10	30	100	300	Ω
Output voltage	34	52	78	122	207	370	660	V

Overload protection

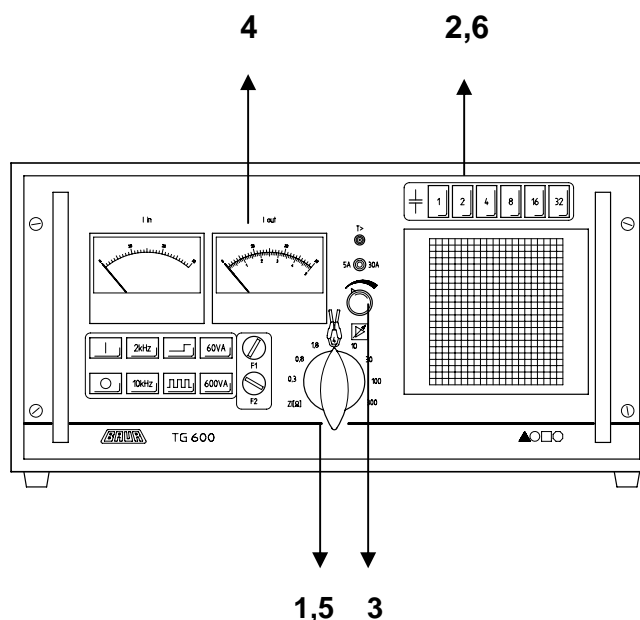
At an output current $I_{out} > 30A$ the output power is switched automatically to 60VA. In this case, turn back power control and switch back again to max. output power 600VA.

Overttemperature switch off

In case of overloading the T600 unit:

- an optical indication is given by the LED „T>“
- the output power is turned down until power output stage is cooled down.

Carry out load adaption



Proceedings

Step	Procedure
1	Set load selector switch to $Z_i = 0.3 \Omega$
2	Switch off all compensation capacitors. Bulbs do not light up.
3	Adjust input current I_{in} using power control regulator. At an output frequency 2 kHz: $I_{in} < 28 \text{ A}$ At an output frequency 10 kHz: $I_{in} < 21 \text{ A}$
4	Read output current I_{out} .
5	Increase value of load selector switch until the output current I_{out} reaches a maximum at a constant input current I_{in} (eg, 5A).
6	Carry out reactive power compensation. Starting with button 1, connect capacitors until input current I_{in} reaches a minimum.

5 Put UL 30 into operation

5.1 Startup

For operation switch on the UL 30 with the ON / OFF button. **The UL 30 performs a self- and battery test.**

With the selection of Last you are switched to the working plane which was used the last time. With <- in the working plane you are entering the main menu. Here a selection of fault location, route tracing and setup is possible.

The display and working of measurement is divided into two planes. A special Switch-Button allows the fast changing between working- and config plane. The first plane the so called "working" plane shows the important figures and allows necessary adjustments which are often needed. The second plane "config" plane shows all adjustable parameters of the selected measuring method.



Only after activating the switch button changing of parameter settings are saved. At a newly recall with "Last" the new settings are active!

The menus of acoustic location are taken as example:

Working plane:



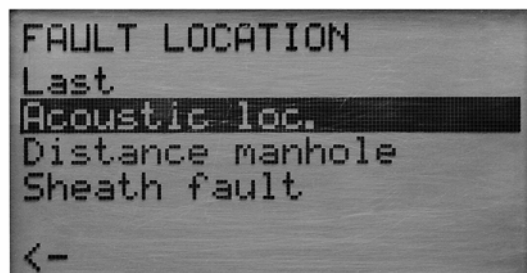
Press SWITCH – Button!!!

Konfig plane:



Press SWITCH – Button or <- !!!
Switch back to working plane.

6 Fault location

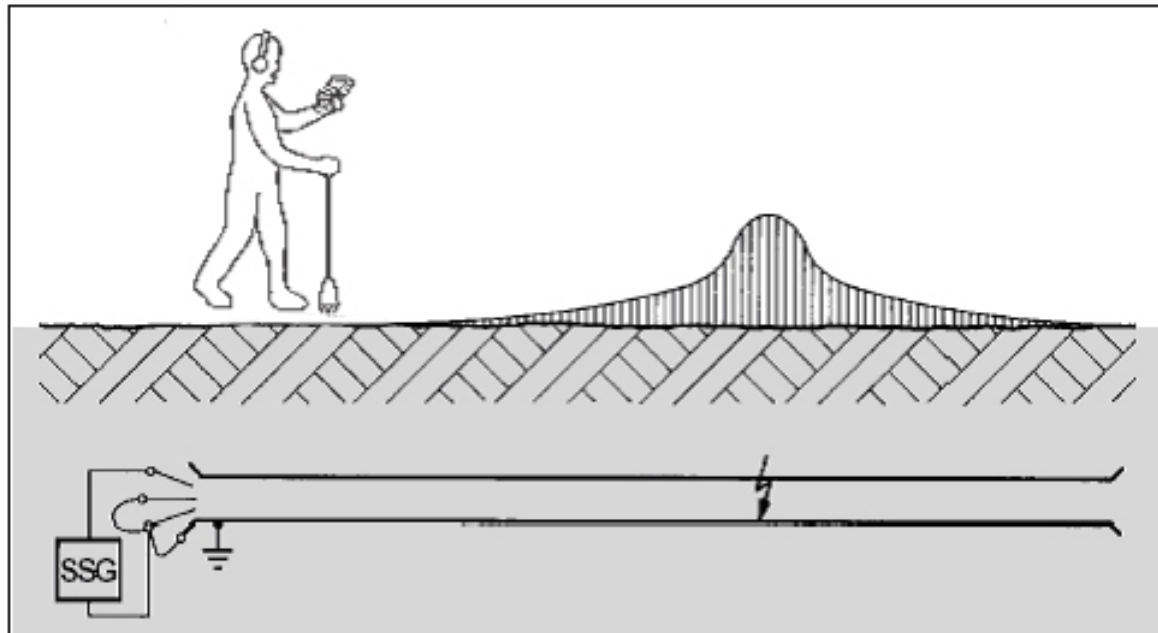


At menu FAULT LOCATION following methods are selectable:

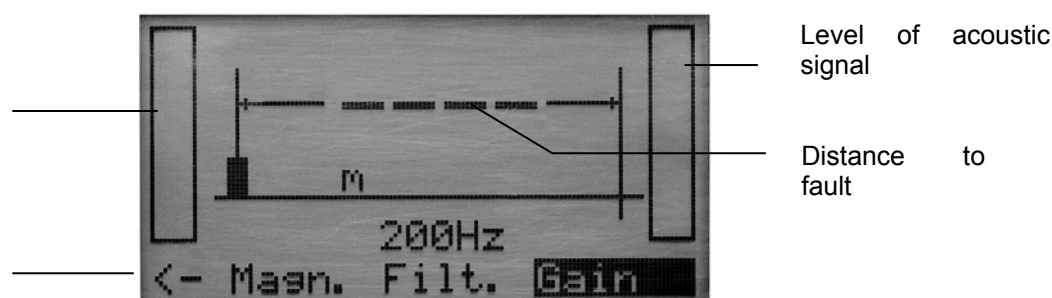
- Last (switch to last measurement with related settings)
- Acoustic location
- Distance manhole
- Sheath fault

6.1 Acoustic fault location

For the acoustic fault location according to the Surge Voltage method a Surge Voltage Generator SSG and a ground microphone BM 30 is necessary additionally.



Working plane:



The parameters “magnetic signal [Magn.]”, “Filter to avoid noise [Filt.]” and “sensitivity of microphone [gain]” can be changed during measurements and can easily be adjusted. The black framed parameter indicates the status (gain is active in the example) Pressing the up or down button allows to adjust the levels.

Konfig Plane:



Magnetic signal:

Adjustment of magnetic signal sensitivity with the right/left buttons. The bargraph shows the present level of sensitivity. In case of magnetic signal receipt a * symbol or number is displayed.

Volume Speaker:

Adjustment of headphones volume

Gain Microphone:

Adjustment of microphone sensitivity. The bargraph shows the current gain. If groundmicrophone is lifted up from ground the microphone is switched soundless automatically. Putting on the device again the signal will be heard after a delay of one second.

Filter Frequency:

Adjustment of filter frequency in various steps between 100Hz and 1kHz. This allows a effective rejection of noises and interferences. The adjusted frequency is displayed. Default setting is OFF.

Magnetic signal:

The impulse current flowing into the cable while SSG operation for pin pointing creates a magnetic field around the cable. This magnetic signal is used to start the propagation time measurement. In case of weak breakdown noise or strong ambient noises the magnetic signal can help to evaluate the acoustic signal better.

The unit:

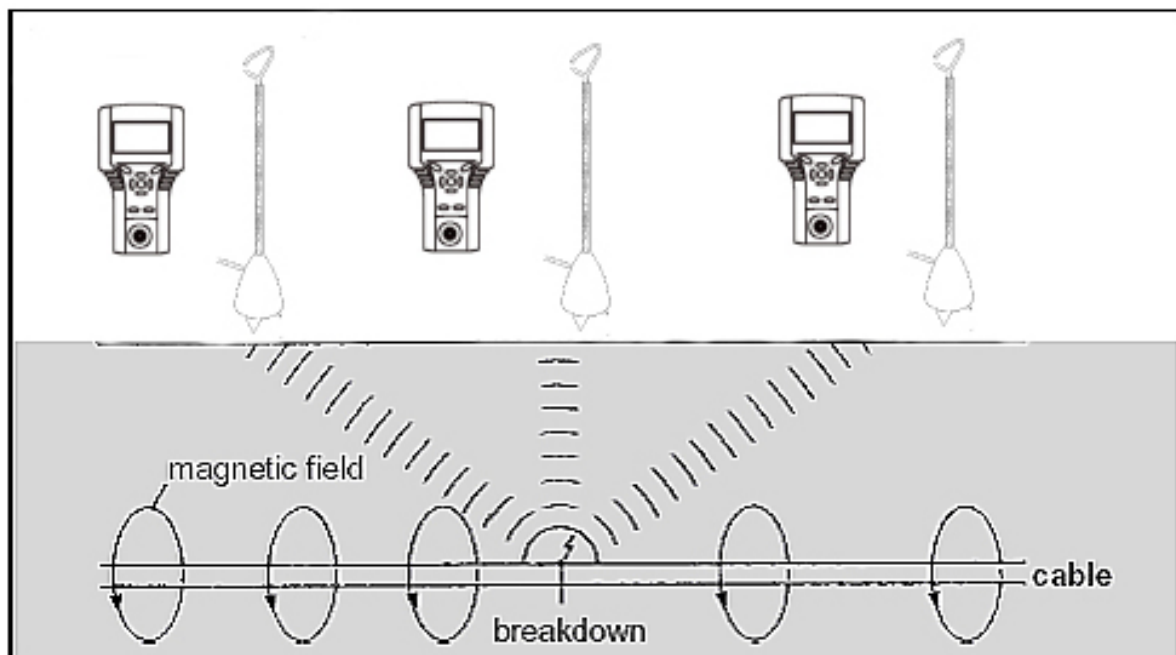
- shows if the Surge Voltage Generator is working properly
- determines the moment when a breakdown noise is to be expected
- indicates, via the signal intensity, if you are going in direction to or from the cable route.

Propagation Time Measurement:

With the propagation time measurement the time difference between receipt of the magnetic and the acoustic impulse is evaluated. Above the fault location the time difference is at minimum. Carry out 2 to 3 measurements with the UL 30 unit at each measuring point with the same setting. The results should not show too much deviation. Then you can be sure that the measurement is correct and no faulty triggering has occurred due to ambient noises.

The time measurement is started by the magnetic impulse and will be stopped by the acoustic signal. To get save results the UL 30 only takes the measurement as good, if the two signals are in a defined time frame and the acoustic signal is clearly identified. (clearly identification of acoustic signal if it is higher than the ambient noises).

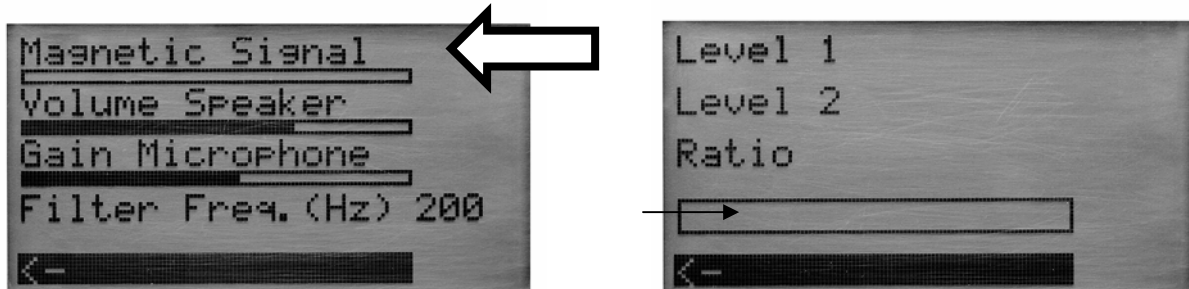
In case of non clear identification the display is showing # # # #. Through increase of acoustic gain it could be possible to get valid measurement. Also the filter adjustment could help to reduce the influence of ambient noises.



Tracing with BM 30

The parallel menu allows a determination of cable route. The black stripe at the housing of microphone shows the parallel direction of cable route.

Enter the parallel menu through pressing OK on Magnetic Signal.

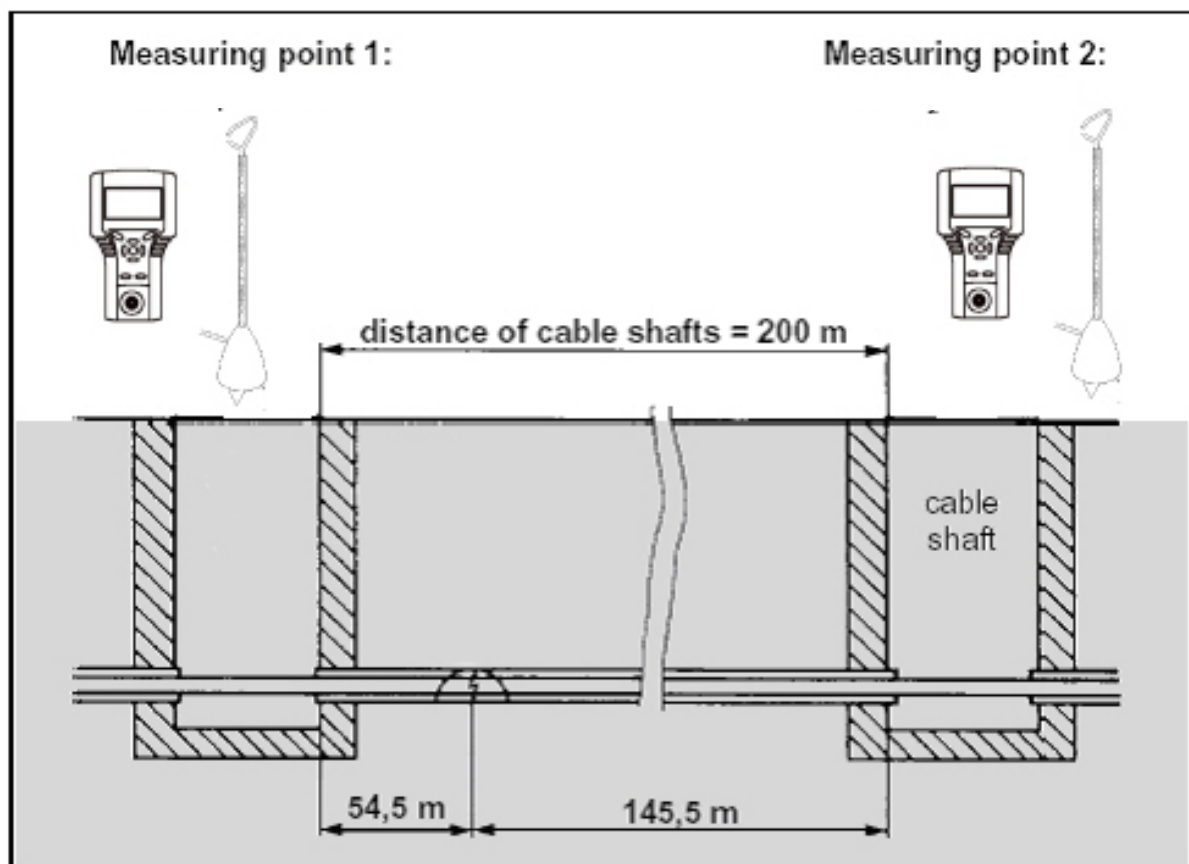


Rotate the BM 30 on his own axe. The Ratio bargraph is changing. Try to detect the maximum. If maximum of bargraph found the black stripe is parallel to the cable.

Attention: Pipes in earth as well as metallic objects on surface could affect this method. In worst case results could be inverted.

6.2 Distance manhole

If no breakdown can be heard from a cable within a pipe (over a bridge or similar buildings) the distance manhole method has be done.



Choose „Distance manhole“ in „acoustic location“ menu and follow step by step the displayed instruction.



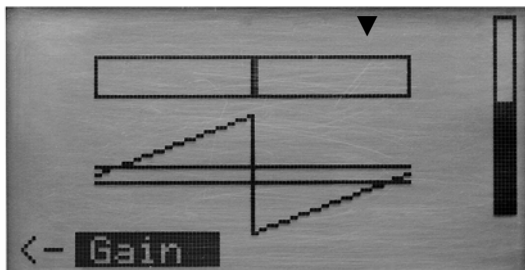
First measurement on first shaft:
2-3 measurements to get a valid result (at example above 54,5m)

Insert distance (200m , steps etc.)

Second measurement on second shaft
2-3 measurements to get a valid result
As result the distance to fault from second shaft is displayed. (145,5m)

6.3 Sheath fault

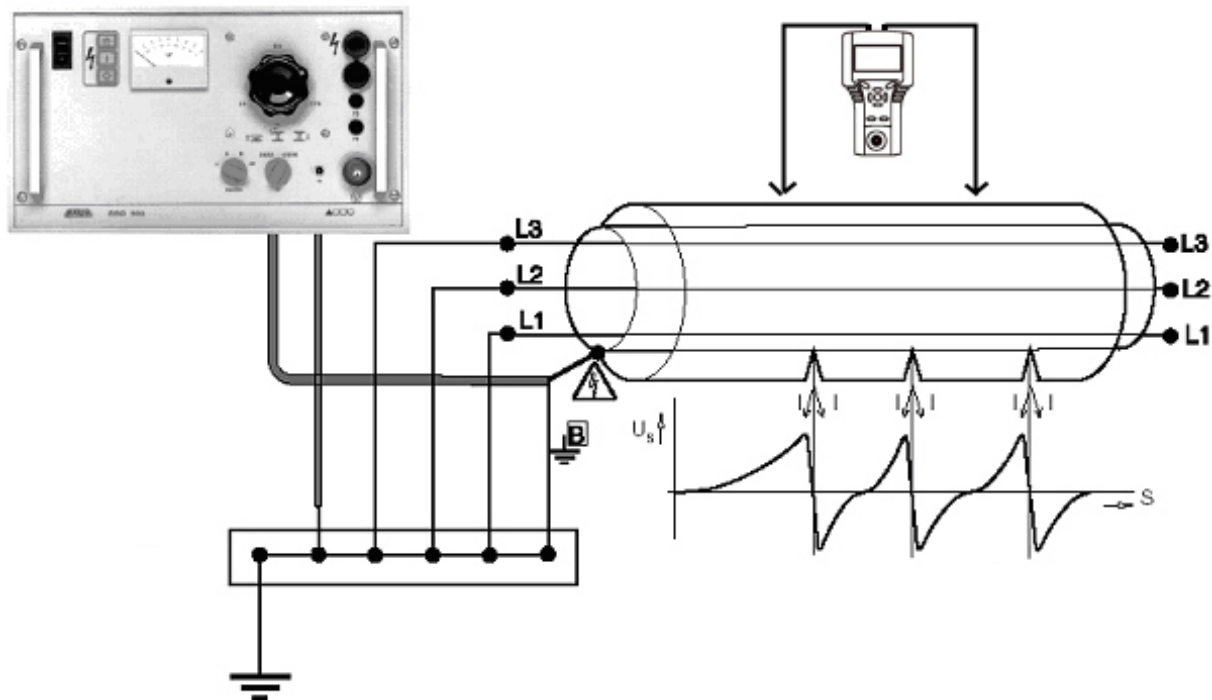
Today's customary method to locate sheath faults is the modified "Wurmbach" procedure. A impulse sequence (SSG) or a impulse block (STG) is sent to the cable under test. The voltage drop at the fault location results in a step voltage which is indicated in the UL 20 with help of cable sheath fault sticks. The UL 30 displays via bargraph and an arrow (drag indicator) the direction to the fault. The drag indicator shows the direction to go until the next impulse has taken place. Additional to the optical display a accoustic information with different tone signals is given. Ahead the fault the bargraph indicates zero.



Peak hold

Deflection	0
Right	
Left	
Acoustic	0
Right	
Left	

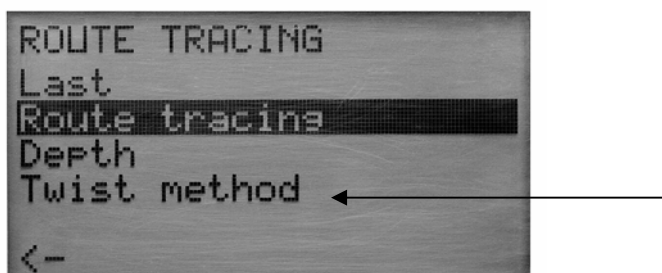
If a cable sheath has several faults, e.g. 2 between 1 k. and 5 k., all 3 faults can be located with the STG or SSG and KMF1 during one passage over the route. This requires appropriate practice and one should know that the step voltage shows several passings through zero (5 passings through zero). The following sketch should serve for better understanding.



In opposite to the pin pointing methods above, the twist method needs a frequency generator (TG 20/50 or TG 600) and a search coil SP 30 instead of SSG and BM 30. When using the twist method, the highest possible power adjustment of the Audio Frequency Generator should be observed. The higher the obtainable output current of the generator, the better the twist effect on the surface can be heard.

Applications:

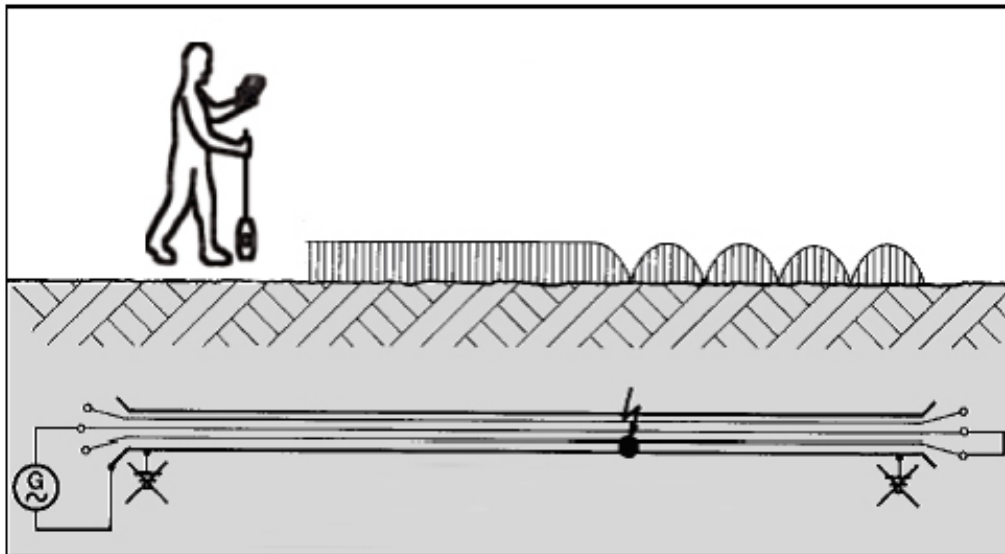
- Cable selection, determination of joints, fault location on multicore lines and cables



The twist method offers particular advantages for low voltage and signal cables, where the maximum permissible voltage is less than 1kV. The cable is loaded only slightly and the route tracing and the location itself can be carried out in one operation. As an example, fast results can be obtained in lighting cables and in house connections. Conditions for a successful twist method measurement:

- Faulty cores must be stranded or pitched and must not be screened one by one.
- Distance of cores < 3 cm
- Fault resistance < 3 Ω
- In case of contact between fault and ground, any existing sheaths must be released from ground (stationary earth).

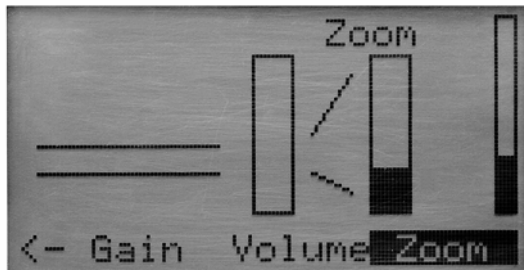
To get a twisting field, a healthy core is used as inverse wire. At the other end a short-circuit bridge is installed.



The twisting field is located until short-circuit is reached. Directly behind the fault the field strength decreases.

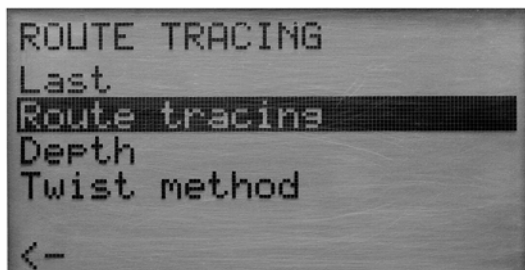
A special filter for twist method is integrated into the UL 30. It filters the basic noises and uses only the real oscillations for fault detection. Adjustment of settings are possible at working plane of twist method.

- Select suitable oscillation pick up by using Zoom



7 Route tracing

Tracing is always possible as active or passive. If a cable is live, the harmonics of the mains frequency can be heard as 'mains hum'. However, all grounded conductors, water pipes and parallel running cables which are connected to the 50Hz mains system also have this 'mains hum'. To avoid confusion, it is recommendable to disconnect conductor and feed cable inductively by using Audio frequency generator to do a active tracing.



At menu ROUTE TRACING following methods are selectable:

- Last (switch to last measurement with related settings)
- Route Tracing
- Depth
- Twist method

Also at route tracing the device is working with working- and config plane. At this planes following settings are possible.

Working plane:



Volume Speaker:

Loudness of loudspeaker adjustable

Gain:

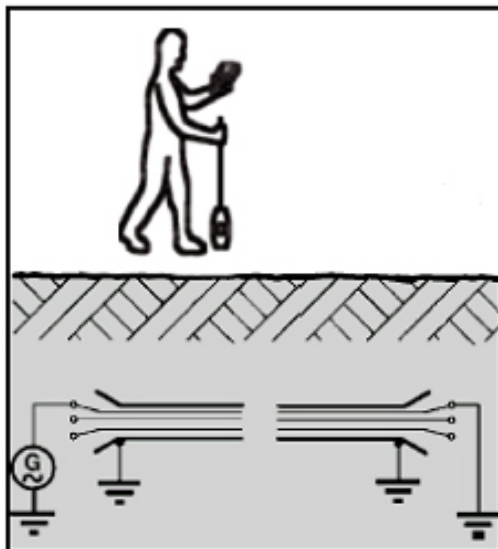
Sensitivity of search coil.

Filter Frequency:

- 50 / 60 Hz for passive tracing
- 815Hz, 2kHz and 10 kHz depends on sending frequency generator
- two additional frequencies adjustable at setup.

7.1 Connection of frequency generator

If this method can be used, galvanic coupling is always the best method.



Application:

- for cable routing

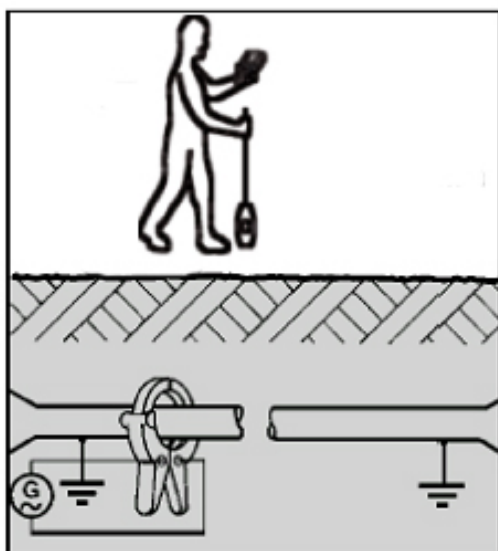
By direct galvanic connection the highest possible ranges can be obtained.

Do not increase current unnecessarily because adjacent lines might otherwise be induced too.

The inverse current is conducted via earth. Please note, that this connection method can cause fault measurements if used on underground lines (e.g., in residential or industrial areas), because the inverse current is also conducted via other cables and lines which are located by the UL 30 unit with a very strong audio frequency signal.

Clip on device AZ 10

The clip-on device can be used with dead and live cables.



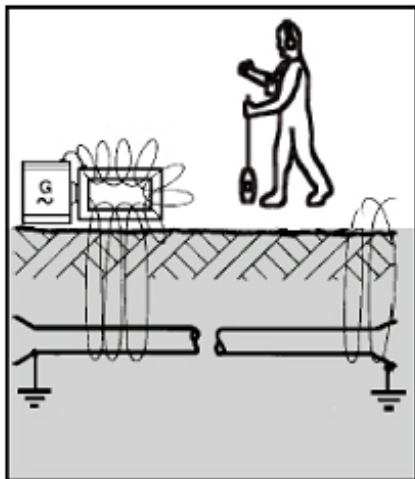
Applications:

- Routing (house connection, water, telephone, gas)

Connection directly on the Audio Frequency Generator. Maximum load of clip-on device approx. 30VA. The highest efficiency is reached by applying the clip-on device in the middle of the cable.

Loop antenna RA 10

For inductive audio frequency signal feeding into metallic pipes and lines which are galvanically not accessible. Turn loop antenna RA10 vertically or inclined. Set Audio Frequency Transmitter TG20/50 to 10kHz frequency and 300 Ω impedance.



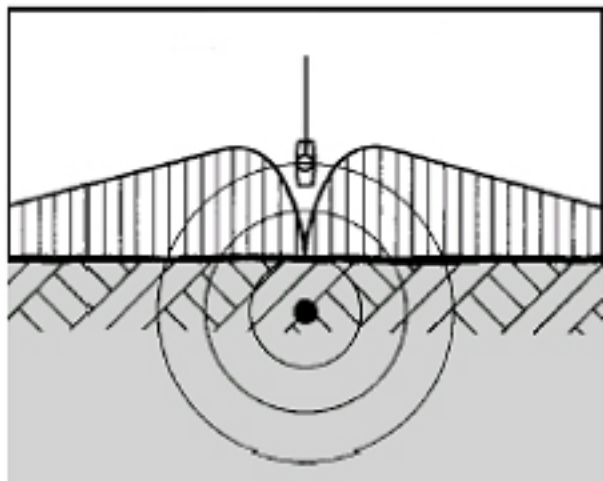
Applications:

- Routing, cable tracing and terrain examination
- for location of water pipes with rubber joints

7.2 Minimum and Maximum method

Minimum method

The detecting coil is vertical to the path of line. Minimum audio frequency signal is directly above line.



Application:

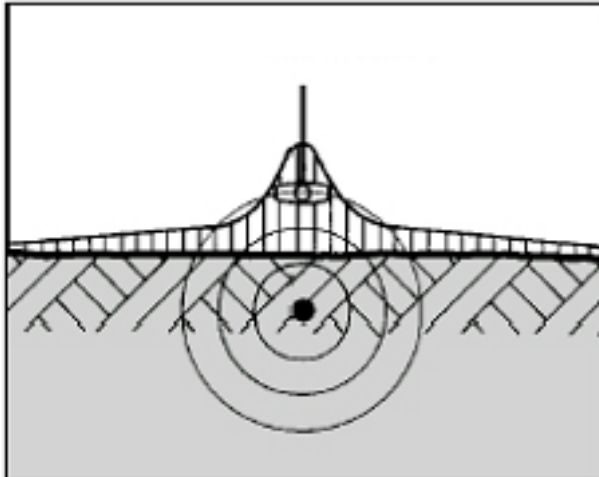
- depth determination
- exact cable tracing and pinpointing

Maximum Method

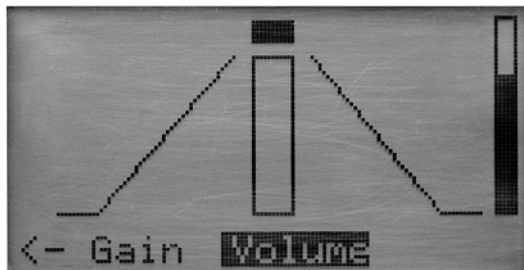
Detecting coil is horizontal to path of line. Maximum audio signal is directly above line.

Application:

- for cable routing
- for terrain examination



The picture beneath shows the working plane of maximum method.

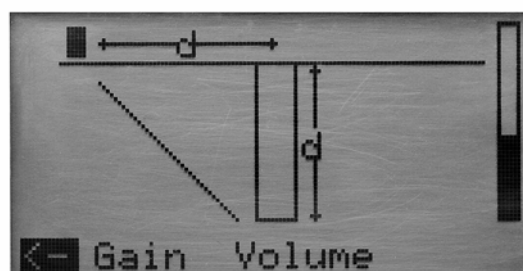
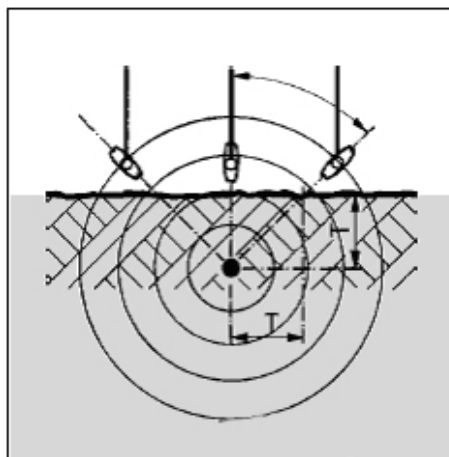


7.3 Depth determination

For measuring the depth (d) of a conductor!

- first determine the exact path of the cable
- subsequently, place coil of detecting rod at 45°

The minimum audio-frequency signal is heard at the depth " d " at a corresponding distance from the path of the cable.

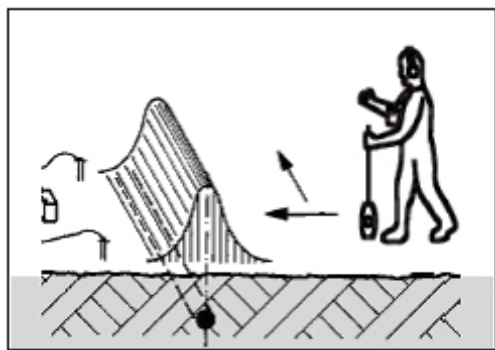
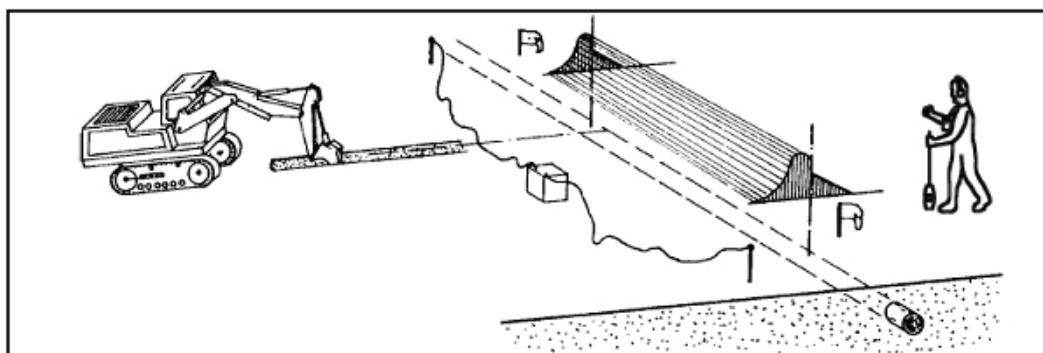


7.4 Terrain examination

To examine a particular area for existing cable/pipes systems we recommend the following procedure:

- Divide the area in question into squares of approx. 25 x 25 m.
- Set up the Audio Frequency Generator in the centre of the cable run.
- Set ground rods into the ground to the left and right of the generator at approx. 12 to 15m.
- Keep output power of generator low.

If there is a metallic conductor within the set out area, it will propagate a magnetic field in its vicinity. The magnetic field has in most cases the shape of a single-sided maximum; e.g. with a steep edge to the audio frequency waveform.



7.5 Cable identification

As this method requires a high technical knowledge for cable identification, the use of a the special instrument KSG 100 is recommended. To prevent possible accidents due to inappropriate handling or misinterpretation of the cable selection, it is generally recommended to use cable cutters according to EN 50340 and/or a cable shooting devices. The local safety and accident precaution instructions are always applicable, and mandatory.

If a cable is to be picked out of several in a cable duct (e.g., cutting for a house connection):

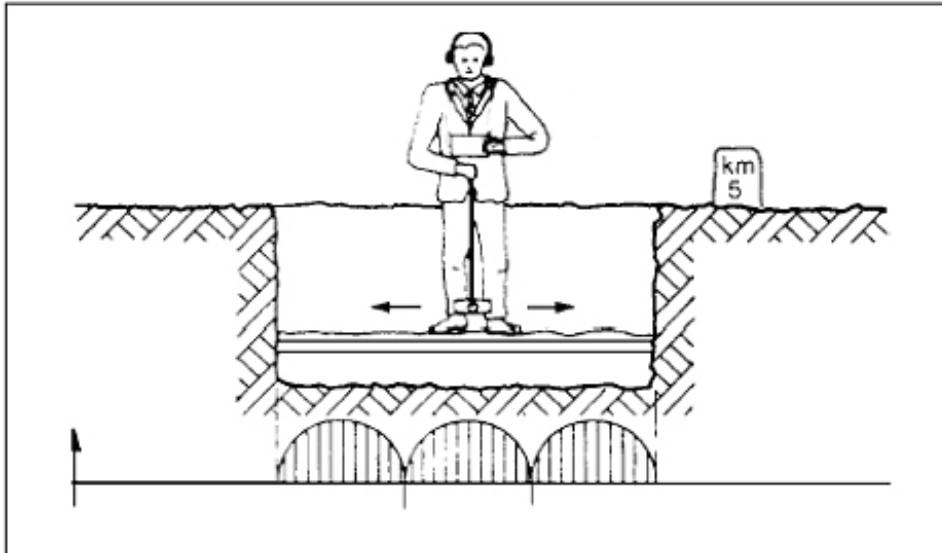
- disconnect the desired cable at all end points
- sheath remains grounded
- connect two wires with each other at one end point
- connect Audio Frequency Generator across 2 short-circuit wires and set current to 0.1 to 0.5 A.

Using the UL 30 unit at the open cableway the twist of the conductor is traced:

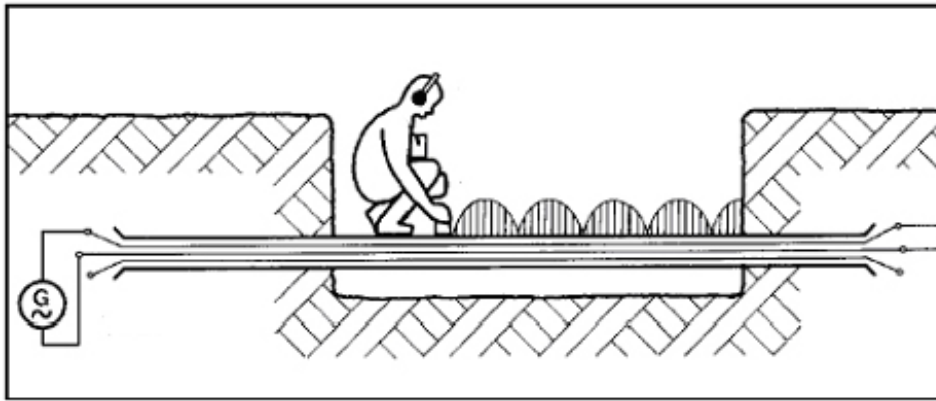
- set searching coil parallel to the cable
- move slowly over the cable to be traced

The twist signal is only received from the cable supplied with current from the Audio Frequency Generator. In case of scattering:

- reduce feed current.



Cable selection with selecting coils AS2/30, AS10/30



With closely picked cables:

- use selecting coil AS2/30

In case of interference frequencies at 2kHz:

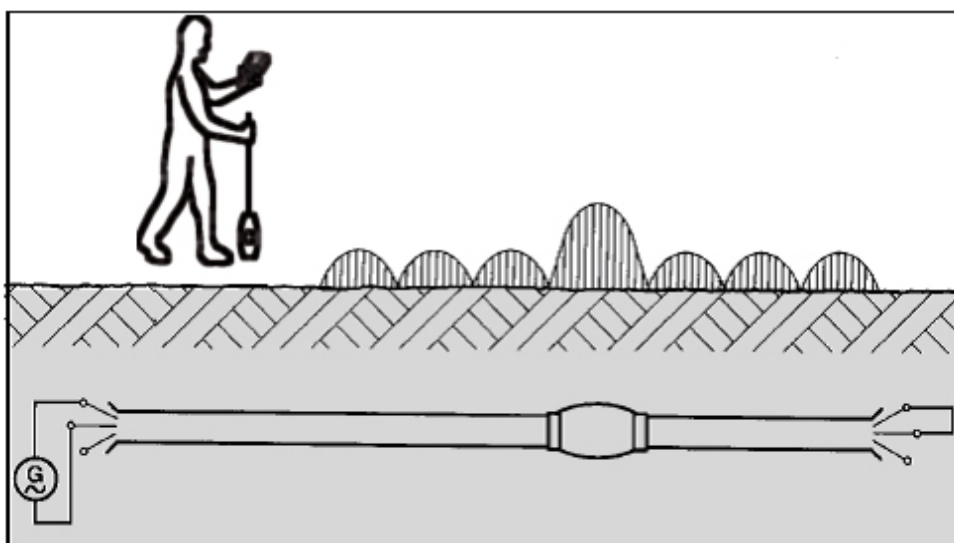
- use selecting coil AS10/30.

For cable selection of live cables:

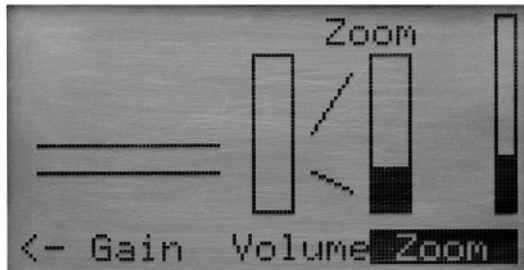
- feed in audio-frequency signal via separating filter or clip-on device AZ10
- use selecting coil AS10/30.

7.6 Determination of joints (Twist method)

Also for this application the search coil SP 30 is used. A signal of a frequency generator is sent to the cable. Therefore joints can be determined with the SP 30. The field strength is amplified by sleeves and branches enabling a accurate pin-pointing of their location.



The joint determination basics on a twist method similar principle. Therefore the special filter for twist method is again integrated into the UL 30. It filters the basic noises and uses only the real oscillations for fault detection. Adjustment of settings are possible at working plane of twist method.



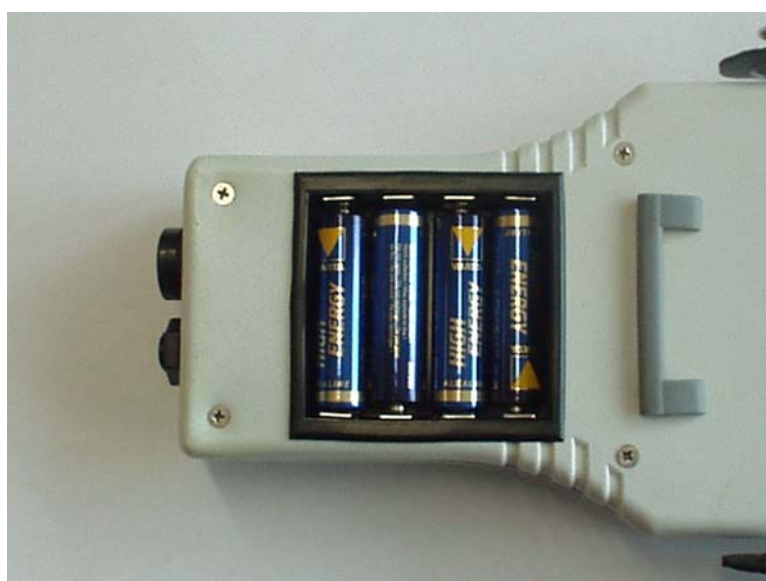
8 Maintenance

Within this section find all necessary information concerning repair and maintenance works.

UL 30 – change of batteries

Empty battery status will be displayed approx. 30 min before switching off.

- Open battery case
- Battery type: 4 x 1.5V Mignon, AA, LR 6
- Change batteries (watch polarity)
- Close battery case
- Check function of UL 30

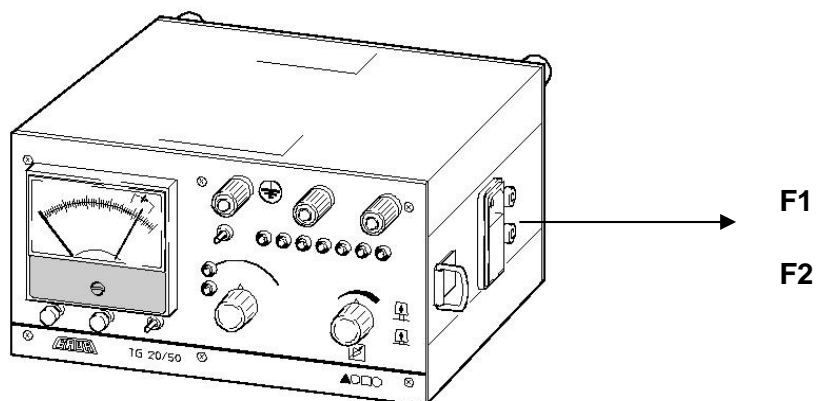


Replace fuses of Audio Frequency Generator



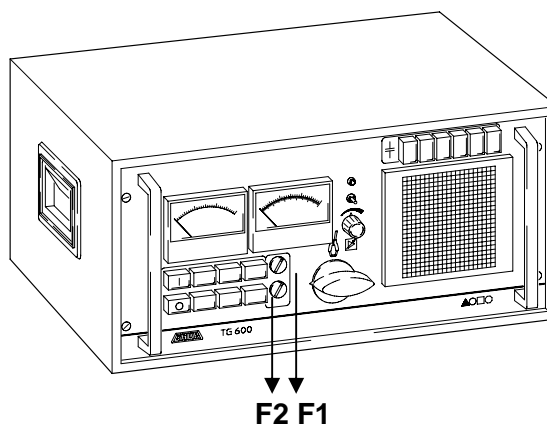
In case of unit switch off due to fuse tripping: Only insert new fuses with the specified rating!

Audio Frequency Generator TG20/50



Set mains voltage	F1	F2	(Ø 6.3 x 30 mm)
110 V / 120 V	T4A/250V	T4A/250V	
220 V / 230 V	T2A/250V	T2A/250V	
240 V	T2A/250V	T2A/250V	
Internal fuse F1: T8A/250V (Ø 5 x 20 mm)			

Audio Frequency Generator TG600



Set mains voltage	F1	F2	(Ø 5 x 20 mm)
110 V / 120 V	T16A/250V	T16A/250V	
220 V / 230 V	T8A/250V	T8A/250V	
Internal fuse F3, F4: T0.5A/250V (Ø 5 x 20 mm)			

Depending on set mains voltage insert specified fuses.



9 Packing and delivery

If units are not used immediately, always store them in the carton and in dry rooms!

Complaints concerning damage should be made to us by the purchaser without delay after receipt of the shipment using a standard damage certificate.

Confirmation in writing of externally visible damage should be obtained from the carrier immediately. The extent and probable cause of the damage should be stated as well.

For damage which is discovered during unpacking the responsible transportation company should immediately be requested verbally and in writing (registered letter) for loss assessment and should be made responsible at the same time!

We also refer to our “**General Sales and Business Conditions**”.



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